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Effect of Diatery Supplimentation with Sodium Bentonite and Kemzyme on Quality Criteria of Rabbit Meat

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SUMMARY

The present study was conducted to clarify effect of kemzyme and /or bentonite feed additives on rabbit meat quality "weight gain", proximate chemical analysis, cholesterol content and bacteriological criteria. Twenty four mature NZW rabbit bucks of about 4 months age average body weight 2.4 kg were equally divided into four groups (6 each) the 1st group was kept untreated as control group (C). The 2nd group was supplemented with 0.1% "kemzyme" multienzyme (K). The 3rd was supplemented with 2% Sodium bentonite (B), while the 4th group was supplemented with 0.1% kemzyme plus 2% Sodium bentonite (KB). The dietary treatment lasted for 10 weeks. The obtained results revealed significance increase in the average daily gain and protein content, while there was reduction in cholesterol content in group fed on (KB) groups.

Key words: Kemzyme, Bentonite, Rabbit meat quality, chemical analysis, bacteriological examination, cholesterol content

INTRODUCTION

Rabbit has a highly palatable and digestible meat for consumers all over the world. The breeding of domestic rabbit on a large scale may provide a useful supply of meat (Khalafalla, 1992) rabbit meat production can offer to the market a lean saleable product with a fat content lower than 9% (Partridge *et al.*, 1989). Using of non traditional diets, however, could affect the caecal microflora activities as well as carcass and meat quality (Aderigbigde and checke, 1993). Kemzyme is a stabilized multienzyme product (proteolyse, lipase and amylase), enhance the feed digestion and nutrient absorption of the digestive tract consequently more energy and more amino acids may be released from the feed and utilized by the animal (Zhang *et al.*, 2001).

Sodium bentonite are clays with strong colloidal properties that absorb water rapidly and result in swelling and manifold increase in volume giving rise a gelatinous substance (Pasta *et al.*, 2007)

Coupling of bentonite to multienzyme feed additives for rabbits could lead to favorable modification in caecal environment presumably, acidification of caecal contents and stabilization of ammonia nitrogen concentration, decreasing caecal pH additionally, co- supplementation increase the serum glucose concentrations, decrease serum triglyceride and cholesterol concentration (AbdI-Rahman *et al.*, 2010). Using of bentonite in the rabbit diet improve weight gain this increase may be attributed to increase feed passage time in the gut of the rabbit, and thus subjected the nutrients to enzymatic action to a quite long time or could have been due to the action of bentonite on the enhanced digestibility of certain nutrients (Santurio *et al.*, 1999)

So, the current study was conducted to investigate the influence of Sodium bentonite and kemzyme as feed additives on a daily gain weight, proximate chemical analysis, cholesterol content and evaluation of bacterial quality were also studied.

MATERIALS AND METHODS

Animal and location

The study was conducted in the experimental rabbitry of the physiology department, Faculty of Veterinary Medicine Cairo University. Twenty four mature male New Zealand white bucks of about 4 months age and commercial cages (55x60x34 cm), equipped with automatic drinkers and feeders. Daily lighting regime was 10 -12 hours photoperiod / day through both natural and fluorescent lighting.

A commercial pelleted diet of 16.7% crude protein, 13.7% crude fiber and 2590 Kcal of digestible energy per kg (***Atmida feed company, Egypt***) was offered adlibitum. Clean fresh water was available all times.

Experimental design

The animals were equally divided into four groups (6 in each) the 1st group was the control group (C), where animals were kept untreated and were fed the basal diet without additives, the second group (K) was supplemented with 0.1% "kemzyme" a multienzyme blend of kemin agrifoods Europe, composed of celluloses, amylases, proteases and lipases. The 3rd group (B) the animals were supplemented with 2% Sodium bentonite (Ghanem, 1995) which purchased from (Morgan for chemicals, Egypt); while the fourth

group (KB) was supplemented with 0.1% kemzyme plus 2% Sodium bentonite. Doses of supplemented additives were mixed with the basal ration pellets. The treatment lasted for 10 weeks.

Preparation of the samples for bacteriological examinations

Each live rabbit taken from the experimental trials was slaughtered and dressed under hygienic conditions, then washed with tap water. From each rabbit carcass 10 g from the breast muscle was cut under aseptic conditions into small pieces, then homogenized in 90 ml of 0.1% peptone water using a stomacher under sterile conditions tenfold serial dilutions (APHA, 1992) for enumeration of aeropic plate count, enterobacteriaceae count ICMSF (1980), staphylococcus count (Bailey and Scott 1982), enumeration of coliforms Most Probable Number (MPN) adapted by (Hitchins *et al.*, 1992), isolation of E. coli (Krieg and Holt, 1984)and isolation of salmonella(FAO, 1992).

Proximate analysis

Calculated according to the methods recommended by (AOAC, 1995) for water content, 2g of the prepared samples were dried in the hot air oven (100 °c) to constant weight. Total fat content (soxhlet method) was extracted with petroleum ether (BP 40- 60 °c), while protein content was estimated by using Kjeldahl procedure and nitrogen content was multiplied by 6.25. Cholesterol content was determined according to the method of (Searcy and Bergquist, 1960) as described by (Rhee *et al.*, 1982). Muscle fat was extracted as described by (Folch *et al.*, 1957). The extracted lipid was sponified with alcoholic KOH and unsponifiable material was extracted with hexane and dried where cholesterol concentration was determined calorimetrically. A cholesterol standard curve was contracted according to the methods of (Allain *et al.*, 1974)

Statistical analysis

All data were analyzed using **Statistical Analysis System** (SAS, 1996). Comparisons between treatments within each analysis were tested. Significance was determined by the F-test and least square means procedure. Main effects were considered significance at $P \leq 0.05$.

RESULTS AND DISCUSSION

Table (1): Effect of Kemzyme and or Bentonite supplementation on average daily weight gain (g/day)

	Control (C)	Kemzyme (K)	Bentonite (B)	Kemzyme and Bentonite (KB)	LSD
Average daily gain (g/day)	$32.21^{a} \pm 1.24$	$37.83^{a} \pm 1.85$	$36.17^{a} \pm 1.75$	$41.13^{b} \pm 2.46$	5.82

Data presented as mean ±SE N=6

Values having different letters in the same row are significantly different at $P \leq 0.05$.

Table (2): Mean values of proximate chemical analysis of the examined samples

Group	Moisture	Fat	Protein	Cholesterol (mg/dl)
Control (C)	73.20^a	8.98^a	16.60^a	172.30^b
Kemzyme (K)	73.20^a	8.50^a	17.30^a	139.05^a
Bentonite (B)	73.10^a	8.00^a	17.20^a	136.03^a
Kemzyme and Bentonite (KB)	72.20^a	8.00^a	18.00^b	131.80^b

Table (3): Mean values of Microbiological status of rabbit carcasses

	Control (C)	Kemzyme (K)	Bentonite (B)	Kemzyme and Bentonite (KB)
APC	$1x10^5 \pm 0.90^a$	$9x10^4 \pm 0.24^a$	$2x10^5 \pm 0.31^a$	$3x10^5 \pm 0.42^a$
Enterobacteriaceae	$3x10^2 \pm 0.14^a$	$1x10^2 \pm 0.11^a$	$2x10^2 \pm 0.13^a$	$2x10^2 \pm 0.13^a$
Staph. count	$8x10^2 \pm 0.21^a$	$3x10^2 \pm 0.14^a$	$4x10^2 \pm 0.24^a$	$4x10^2 \pm 0.24^a$

Table (3): Isolated Microorganisms from rabbit carcasses

	No. of samples examined	Slaughtered Rabbit	
		No. of +ve samples	%
Staphylococcus aureus	24	3	12.5
E.coli	24	1	4.2
Salmonella	24	0	0

The control and different treated groups of rabbit carcasses were of high sensory quality as there was no change in color, texture, odor and overall acceptability parameters between them. The values of average weight gain of rabbit fed on diets rations of different groups are given in table (1). The improvement in weight gain observed in group (KB) could have been due to the presence of Sodium Bentonite in the diet may be prolonged feed retention time in the gut of the rabbit that subjecting the nutrients to enzymatic action by kemzyme for quite a long time, these results are in agreement with previous studies (Santurio, 1999, Brenes *et al.*, 2002 and Pasta *et al.*, 2007), in which incorporation of multienzyme and bentonite are significantly improved body weight gain in rabbit, proximate composition (moisture, protein, fat and cholesterol) content of rabbit carcasses given diet with various treatments with (K) and (B) are shown in table (2).

Protein content in group (KB) was significantly ($P \leq 0.05$) higher than that of the other groups, such results may be referred to coupling of bentonite to multienzyme feed additives to rabbits diets lead to stabilization of ammonia nitrogen concentration and improved utilization of dietary nitrogen, the obtained results were in harmony with that recorded by Abdl-Rahman *et al.*, (2010). Moreover, the result given in table 2 indicated that there were no significant difference could be recognized in moisture and fat content among groups as a result of supplementation of either (K) and (B) but by using these combination (KB). A significant difference reduction in cholesterol

content was recognized than other groups. Such results emphasized the opinion of Lebas and Collin, (1992) who stated that co-supplementation with (K) and (B) increase serum glucose concentration and decrease serum triglyceride and cholesterol content.

Table (3) showed that there is no significant difference in the mean APC values, Enterobacteriaceae, staphylococcus and coliforms count of slaughtered rabbits for control (C) and different treated groups. In addition to compare with microbiological standards of rabbit meats, these counts did not exceed the recommended limits reported by (ICMSF, 1978) Moreover, lower bacterial count in the present study in compare with higher counts in previous studies as (Khater et al., 2009) may be attributed to the difference in hygienic condition during preparation, handling and distribution. Such results are agreed with the finding reported with Shelton *et al.*, 1961; Reberte, 1975 and Khalafalla, 1992.

From table (4) *Staphylococcus aureus* were isolated from slaughtered rabbit of different groups with incidence of (12.5%), while *E.coli* are (4.2%). Salmonella couldn't be isolated from any sample, these results agree with previous findings as Genigeorgis et al., (1989).

Under the conditions of this study it could be concluded that coupling of Bentonite and Kemzyme feed additives to rabbits diets lead to achieved significant increase in protein content and reduction in cholesterol content. Moreover, none of the quality parameters were influenced by these feed additives.

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تأثير إضافة الصوديوم بنتونيت و الكيمزيم لعلائق الأرانب على جودة ذبائحها

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تهدف هذة الدراسة إلى معرفة مدى تأثير الصوديوم بنتونيت و الكيمزيم في علائق الأرانب على جودة ذبائحها من حيث الوزن و التركيب الكيميائي (الرطوبة- البروتين – الدهن) و نسبة الكوليسترول في اللحم بالأضافة إلى الجودة الحسية و البكتريولوجية

و في هذا الصدد تم تربية (٢٤ أرنب) نيوزيلندي عمرها أربعة أشهر بمتوسط وزن ٢.٤ كجم و تقسيمها إلى أربعة مجموعات (٦ أرانب)للمجموعة و تغذية كل مجموعة على عليقة مختلفة. فالمجموعة الضابطة يتم تغذيتها على عليقة أساسية بدون اي إضافات أما المجموعة الثانية فقد تم تغذيتها على العليقة الأساسية مع إضافة كيمزيم بنسبة ٠.١ % و كذلك المجموعة الثالثة تم تغذيتها على نفس العليقة مع إضافة الصوديوم بنونيت بنسبة ٢% أما المجموعة الرابعة فقد تم تغذيتها على نفس العليقة الأساسية مع إضافة كيمزيم بنسبة ٠.١% و إضافة الصوديوم بنتونيت بنسبة ٢%.

و لقد أستمرت التجربة لمدة ١٠ أسابيع و قد أظهرت النتائج وجود زيادة معنوية في متوسط زيادة الأوزان و نسبة البروتين و نقص معنوي في نسبة الكوليسترول في اللحم في المجموعة التي تم تغذيتها على علائق تحتوي على كيمزيم بنسبة ٠.١% و الصوديوم بنتونيت بنسبة ٢% و أوضحت النتائج أيضاً عدم وجود فروق معنوية في نتائج الفحص الحسي و لبكتريولوجي بين المجموعات المختلفة.